RENAUD BROS., INC.

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Brattlboro BRO 1442 (35)

Excavation Support Plan

Description
The excavation support plan includes a combination of trench boxes and concrete gravity blocks. The trench boxes all have stamped certification documents, and the concrete blocks will be stacked back from the edge of the trench boxes. The water will be diverted using the approved water diversion plan. The water diversion pipe will be supported as necessary.
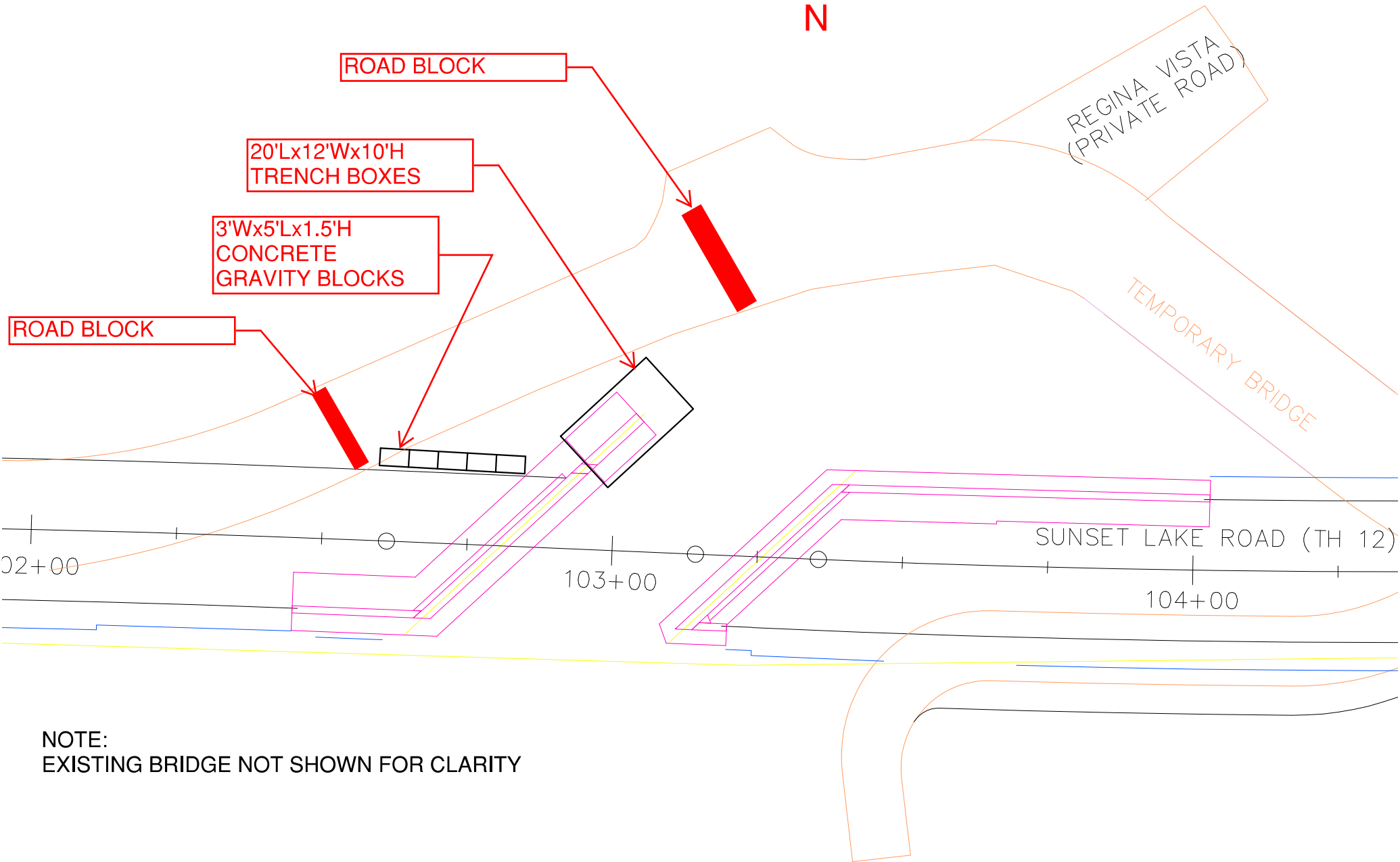
Phase One
Phase one includes building the westerly 12 feet of abutment 1. Regina Vista would be shutdown at the intersection of Sunset lake road to the first driveway. We would still maintain access to 14 Regina Vista, Valery Yandow's driveway. The traffic for Regina Vista would utilize the temporary bridge for access. During phase one the existing structure would be left in place and in use.

The 10 foot trench box will be excavated in evenly to the bottom of footing depth. To support the rest of the trench we will step back the top of the excavation and use concrete blocks to support the top of the excavation.

Once the first 12 feet of the abutment is complete the hole will be backfilled evenly and the trench box worked up. Regina Vista will be brought back to grade paved and opened to traffic.

Phase Two
Phase two includes the demolition of the existing bridge and complete excavation of abutment one with the use of two 20 foot long 10 foot high trench boxes. The upper portion of the excavation will be supported by concrete blocks and sloped back. Abutment one will be completed and backfilled before Abutment two is started. Abutment two will be excavated and constructed from the downstream end to the upstream end.

N

ROAD BLOCK

20'Lx12'Wx10'H
TRENCH BOXES

3'Wx5'Lx1.5'H
CONCRETE
GRAVITY BLOCKS

ROAD BLOCK

REGINA VISTA
(PRIVATE ROAD)

TEMPORARY BRIDGE

SUNSET LAKE ROAD (TH 12)

02+00

103+00

104+00

NOTE:
EXISTING BRIDGE NOT SHOWN FOR CLARITY

EXCAVATION SUPPORT PLAN
PHASE 1
PAGE 2

N

3'Wx5'Lx1.5'H CONCRETE GRAVITY BLOCKS STACKED FIVE HIGH

REGINA VISTA (PRIVATE ROAD)

DETOUR

TEMPORARY BRIDGE

20'Lx12'Wx10'H TRENCH BOXES

SUNSET LAKE ROAD (

103+00
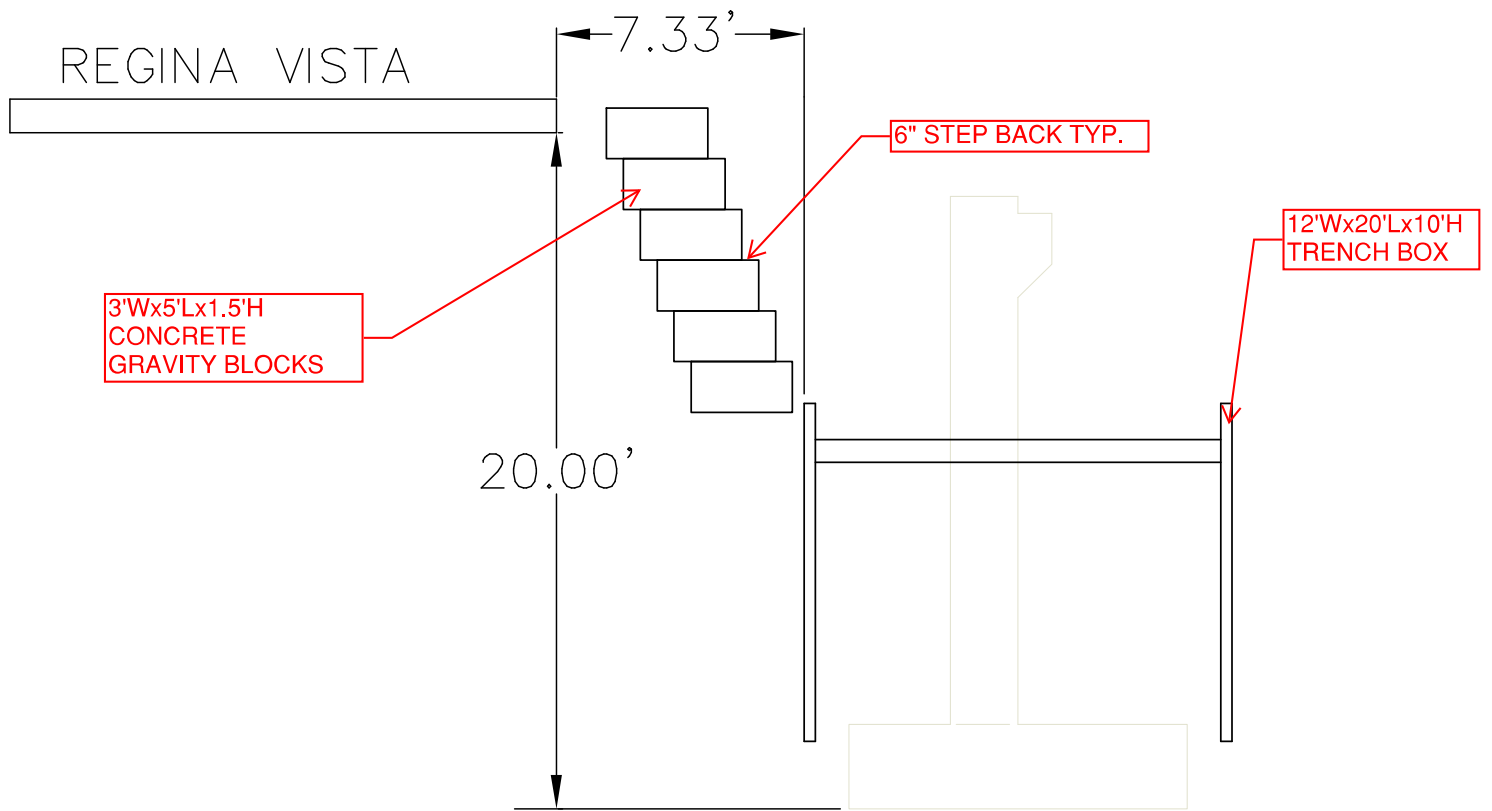
104+00

SLOPEING GRADE 1-1

SLOPEING GRADE 1.5 TO 1

ROAD BLOCK

ROAD BLOCK

10'Wx20'L ROAD PLATES

NOTE:
EXISTING BRIDGE NOT SHOWN FOR CLARITY

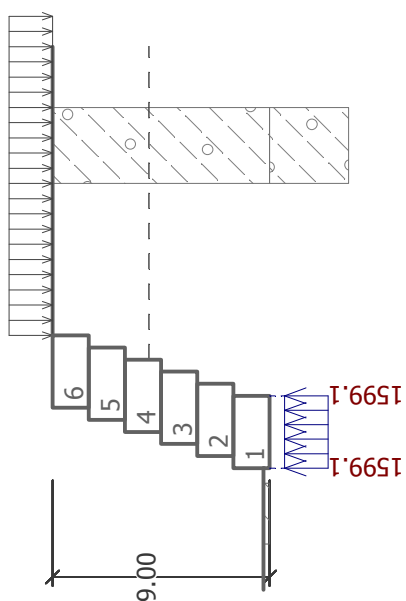EXCAVATION SUPPORT PLAN
PHASE 2
PAGE 3

REGINA VISTA

|←——— 7.33' ———→|

6" STEP BACK TYP.

12'Wx20'Lx10'H
TRENCH BOX

3'Wx5'Lx1.5'H
CONCRETE
GRAVITY BLOCKS

20.00'

SECTION AT THE CONSTRUCTION JOINT

EXCAVATION SUPPORT PLAN

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Name :	Bearing cap.	Stage : 1; Analysis: -1

Prefab wall analysis

Input data

Project

Task   : SUNSET LAKE ROAD
Descript. : GRAVITY BLOCK RETAINING WALL
Author   : RON BELL
Customer : RENAUD BROS.
Date   : 6/3/2014

Settings

USA - Safety factor
Materials and standards

Concrete structures : ACI 318-11

Wall analysis

Active earth pressure calculation :   Coulomb
Passive earth pressure calculation : Mazindrani (Rankin)
Earthquake analysis :   Mononobe-Okabe
Shape of earth wedge :   Calculate as skew
Verification methodology :   Safety factors (ASD)

Safety factors		
Permanent design situation		
Safety factor for overturning :	$SF_o =$	1.50 [–]
Safety factor for sliding resistance :	$SF_s =$	1.50 [–]
Safety factor for bearing capacity :	$SF_b =$	2.00 [–]
Safety factor for sliding along geo-reinforcement :	$SF_{sr} =$	1.50 [–]

Geometry of structure

Slope of wall = 0.00 °

No.	Width b [ft]	Height h [ft]	Offset k [ft]	Offs.(L) o_1 [ft]	Offs.(R) o_2 [ft]	Self w. [pcf]	Friction [–]	Cohesion [psf]	Shear bear.cap. R_s [lbf/ft]
6	3.00	1.50	0.50	0.00	0.00	150.00	0.533	0.0	0.00
5	3.00	1.50	0.50	0.00	0.00	150.00	0.533	0.0	0.00
4	3.00	1.50	0.50	0.00	0.00	150.00	0.533	0.0	0.00
3	3.00	1.50	0.50	0.00	0.00	150.00	0.533	0.0	0.00
2	3.00	1.50	0.50	0.00	0.00	150.00	0.533	0.0	0.00
1	3.00	1.50	0.00	0.00	0.00	150.00	-	-	-

Note: Blocks are ordered from bottom to the top

Basic soil parameters

No.	Name	Pattern	φ_{ef} [°]	c_{ef} [psf]	γ [pcf]	γ_{su} [pcf]	δ [°]
1	Gravelly silt (MG), consistency firm		29.00	160.0	121.00	58.50	28.00

All soils are considered as cohesionless for at rest pressure analysis.

Soil parameters

Gravelly silt (MG), consistency firm
Unit weight : γ = 121.0 pcf

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Stress-state : effective
Angle of internal friction : φ_{ef} = 29.00 °
Cohesion of soil : c_{ef} = 160.0 psf
Angle of friction struc.-soil : δ = 28.00 °
Soil : cohesionless
Saturated unit weight : γ_{sat} = 121.0 pcf

Geological profile and assigned soils

No.	Layer [ft]	Assigned soil	Pattern
1	9.00	Gravelly silt (MG), consistency firm	
2	-	Gravelly silt (MG), consistency firm	

Terrain profile

Terrain behind the structure is flat.

Water influence

GWT behind the structure lies at a depth of 4.00 ft
Uplift in foot. bottom due to different pressures is not considered.

Input surface surcharges

No.	Surcharge new	Surcharge change	Action	Mag.1 [lbf/ft^2]	Mag.2 [lbf/ft^2]	Ord.x x [ft]	Length l [ft]	Depth z [ft]
1	YES		permanent	500.0				on terrain

No.	Name
1	VEHICLE

Resistance on front face of the structure

Resistance on front face of the structure: 1/3 pass., 2/3 at rest
Soil on front face of the structure - Gravelly silt (MG), consistency firm
Angle of friction struc.-soil δ = 28.00 °
Soil thickness in front of structure h = 0.25 ft

Terrain in front of structure is flat.

Settings of the stage of construction

Design situation : permanent

Verification No. 1

Forces acting on construction

Name	F_{hor} [lbf/ft]	App.Pt. z [ft]	F_{vert} [lbf/ft]	App.Pt. x [ft]	Design coefficient
Weight - wall	0.0	-4.50	4050.0	2.75	1.000
FF resistance	-50.2	-0.12	0.0	0.00	1.000
Active pressure	183.8	-1.60	97.7	3.31	1.000
Water pressure	781.2	-1.67	0.0	5.50	1.000
VEHICLE	946.5	-3.59	649.5	4.25	1.000

Verification of complete wall

Check for overturning stability
Resisting moment M_{res} = 14221.5 lbfft/ft
Overturning moment M_{ovr} =   4987.8 lbfft/ft

Safety factor = 2.85 > 1.50
Wall for overturning is SATISFACTORY

Check for slip
Resisting horizontal force H_{res} = 3139.16 lbf/ft
Active horizontal force H_{act} = 1861.41 lbf/ft

Safety factor = 1.69 > 1.50
Wall for slip is SATISFACTORY

Forces acting at the centre of footing bottom
Overall moment M = -2037.8 lbfft/ft
Normal force   N = 4797.26 lbf/ft
Shear force   Q = 1861.41 lbf/ft

Overall check - WALL is SATISFACTORY

Bearing capacity of foundation soil

Forces acting at the centre of the footing bottom

No.	Moment [lbfft/ft]	Norm. force [lbf/ft]	Shear Force [lbf/ft]	Eccentricity [ft]	Stress [psf]
1	-2037.8	4797.26	1861.41	0.00	1599.1

Bearing capacity of foundation soil check

Eccentricity verification
Max. eccentricity of normal force e   =   0.00 in
Maximum allowable eccentricity e_{alw} = 11.88 in

Eccentricity of the normal force is SATISFACTORY

Footing bottom bearing capacity verification
Max. stress at footing bottom σ = 1599.1 psf
Bearing capacity of foundation soil R_d = 4000.0 psf

Safety factor = 2.50 > 2.00
Bearing capacity of foundation soil is SATISFACTORY

Overall verification - bearing capacity of found. soil is SATISFACTORY